# Entrepreneurial University Transformation in Indonesia: A Comprehensive Assessment of IPB

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***Abstract*** **- This article [1] explores university entrepreneurial transformation in Indonesia with a case of Bogor Agricultural University (IPB). Data and information were collected through a content analysis of university policy and educational documents, a structured survey with 331 respondents, in particular staff and students, and 21 in-depth interviews and 5 focus group discussions with 77 people comprising university top-management, faculty, students, and external stakeholders. The European Commission/OECD entrepreneurial university framework was applied for the data analysis. In addition, quantitative indicators were compared with 76 Indonesian and 15 Asian universities. Findings indicate that IPB is an entrepreneurial university from the perspective of research-based technology transfer and innovation. In addition, qualitative information indicates that the entrepreneurial development of the learning and teaching processes needs more attention, however when quantitatively assessed, the student entrepreneurship output is high in relation to many other universities. The results have relevance for the higher education community in terms of understanding the complexity of transforming knowledge institutions into more entrepreneurial organizations. The authors demonstrate a holistic assessment methodology and subsequently propose objective measurements for assessing the entrepreneurial status of a university.**

***Keywords: entrepreneurial university; Indonesia; Asia; entrepreneurship education; higher education; indicators; organizational change***

## I. Introduction

Indonesia is the largest economy in Southeast Asia with a GDP of around 2.8 trillion USD, in size number nine globally, and with an annual growth rate of around five per cent [2]. Micro, small and medium enterprises (MSMEs) are the backbone of the Indonesian economy. They account for around 99 percent of all firms in all economic sectors and 57 percent of the Indonesian GDP in 2012, and employ over 95 percent of the population [3]. According to the Global Entrepreneurship Development Index (2016), Indonesia ranks 103 in the world and 18 in the Asia Pacific region [4]. Many programs are set-up by government, universities, and private sector to stimulate entrepreneurship development as an instrument for employability and poverty alleviation (estimated 11.3 percent of the population living below poverty line: CIA, 2016).

Universities play an important role in the economic development as provider for highly-knowledgeable and skilled young entrepreneurs as well as new know-how and technologies. They are offering entrepreneurship education as a way to develop the entrepreneurial mind-set of graduates, encouraging university students to become self-employed, and are setting-up technology transfer mechanisms. Also in Indonesia, many universities have promoted entrepreneurship development and set-up entrepreneurship education programs [5]. However, this requires an entrepreneurial university [6,7,8,9,10]. This paper therefore explores the entrepreneurial transformation process of universities in Indonesia.

A study has been carried out in 2015 and 2016 to assess the entrepreneurial characteristics and entrepreneurship development activities of Bogor Agricultural University/Institut Pertanian Bogor (IPB), applying the assessment framework for European entrepreneurial higher education institutions named HEInnovate [11]. Subsequently, IPB has been compared with other universities using a few

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quantitative indicators. In this study, Gibb's definition of Entrepreneurial Universities has been used [12] which refers to an academic organization that is conducive for staff and students to demonstrate enterprise, innovation and creativity, that creates public value, partners with local, regional, national and international stakeholders, and is able to effectively operate in a dynamic context.

The case of IPB is chosen, because it is one of the leading national public universities of the country, taking up a position of dominance in education, research and community outreach. Founded in 1963, the university with its 24,000 students is operating center-stage in the framework of the private-sector led and agricultural sector driven economic development policies. In 2016, IPB entered the Top 100 of QS World University Ranking by subject on Agriculture and Forestry. Nationally, IPB received in 2012 the award of being the university with the highest number of registerred patents, in 2015 for the highest number of commercialized patents, and in 2016 for the most productive IP office.

This paper first reviews literature on entrepreneurial universities, entrepreneurship education and university comparison and describes the research methodology used. Next, it presents the main findings and concludes with a discussion and conclusions.

## II. LITERATURE REVIEW

In 1998, Burton Clark introduced the entrepreneurial university concept explaining how higher education institutions deal with growing number of students vis-à-vis limited resources, the demand for contributing to economic growth with innovation and knowledge generation, the information and communication technology revolution, and globalization [13,14,15,16,17,18]. Central to Clark's non-economic interpretation is the transformation of government-sponsored universities to a more independent status [19]. The entrepreneurial university is perceived to be able to cope with societal challenges by innovation in research, knowledge exchange, teaching and learning, governance and external relations [20].

Another, more economic approach that has become dominant in the discourse on entrepreneurial universities, is advocated by, among others, Etzkowitz [21,22], in which the focus is on the role of universities in innovation and regional economic development through translating research into commercial outcomes. Traditionally, innovation is derived from academic knowledge, whilst this is nowadays complemented by a contrary process in which problems in society are researched in search for scientific solutions. Etzkowitz illustrates this with university incubator facilities in which some start-ups are the spin-off of academic research, whilst others are small firms that seek the proximity of the university with its access to academic knowledge. He positions universities in a so-called triple helix innovation system in which academia, businesses and government cooperate. In this knowledge infrastructure, entrepreneurial universities are institutions that transform themselves into entrepreneurial enterprises of innovation, knowledge transfer, and technology commercialization [23,24]. Also, the Indonesian Ministry of Research, Technology and Higher Education stresses the importance of triple helix cooperation in its strategy for preparing new entrepreneurs in agriculture and technology [25].

### *A. Entrepreneurial university frameworks*

The literature reveals different frameworks for understanding the entrepreneurial university [26,27,28,29,30,31]. For instance, Kirby (2006) focuses on entrepreneurial behaviour, cultural entrepreneurial aspects of the institute and individual mind-set and skills. In 2013, the OECD Local Economic and Employment Development Programme together with the European Commission's Directorate General for Education and Culture launched an online self-assessment tool for European entrepreneurial higher education institutions named HEInnovate [32]. HEInnovate is not seen by their authors as a benchmarking tool. It is seen to help self-assessment of the entrepreneurial universities development by the universities themselves for internal use and comparisons over time against their previous assessments. Although elements of Etzkowitz innovation-focused model are included, in particular the importance of multi-stakeholder knowledge exchange and partnerships, the European Commission/OECD framework is comprehensive, inspired by Clark's broad entrepreneurial university concept of institutional transformation. It is operationalized in seven categories of statements that are considered to be characteristic for an entrepreneurial university: 1) Leadership and Governance; 2) Organizational capacity; 3) Entrepreneurial Teaching and Learning; 4) Preparing and Supporting Entrepreneurs; 5) Knowledge Exchange and Collaboration; 6) Internationalization; and 7) Measuring impact.

Also in 2013, the National Centre for Entrepreneurship in Education in Coventry, United Kingdom (NCEE) published the University Entrepreneurial Scorecard [33]. Just as HEInnovate, this scorecard is operationalized in qualitative statements (around 100) but divided over six categories meant to explore the entrepreneurial capacity of a university. These categories are: i) Concept, vision, mission and strategy; ii) Governance; iii) Organizational design; iv) Public value and Stakeholder engagement; v) Knowledge exchange and Incubation; and vi) Internationalization.

The most recent framework is introduced in 2016 by the Accreditation Council for Entrepreneurial and Engaged Universities (ACEEU). This is a new body set-up by the University-Industry International Network (UIIN) meant to provide institutional accreditation with a focus on entrepreneurship and engagement. ACEEU is structuring entrepreneurial universities along five dimensions: 1) Orientation and strategy (institutional commitment, shared goals, financial planning); 2) People and organizational capacity (leadership, staff profile, incentives and rewards); 3) Drivers and enablers (culture, internal support structures, service alignment); 4) Education, research and third stream activities (education, research, third mission activities); 5) Innovation and impact (continuous improvement, influence within the ecosystem, impact). In its definition of entrepreneurial university, ACEEU puts emphasis on the economic impact of societal contributions, entrepreneurship development in education, commercialization of research, and entrepreneurship as priority in third mission activities [34].

**Box 1. The seven categories of the European Commission/OECD self-assessment framework for entrepreneurial universities**

1. Leadership and Governance: This category groups aspects such as the institutional mission, vision, and strategy, the role of top-management, institutional-wide coordination, the level in which innovative activities are stimulated, and the strategic role the institution plays in regional development.
2. Organizational capacity: funding, people and incentives: This is a about the resources, in money and people, which are needed for fulfilling the entrepreneurial mission and strategy. An important aspect is the level in which entrepreneurial behavior of staff is incentivized.
3. Entrepreneurial Teaching and Learning: This is a cluster of variables dealing with the level to which entrepreneurial mindsets are stimulated in education, both in content as well as approach.
4. Preparing and Supporting Entrepreneurs: This is dealing with the programs and facilities the institution has in place for supporting those students, staff and alumni that want to start-up a business, including giving access to finance, networks, and incubation.
5. Knowledge Exchange and Collaboration: This clusters aspects on how the institution organizes and stimulates knowledge creation with and for the benefit of the social, cultural and economic development of society.
6. The internationalized institution: Higher education institutions operate in an internationalized (knowledge) society. For an entrepreneurial institution seeking for innovation and improvement, internationalization is important. This category clusters aspects of internationalization such as staff and student mobility and international research and partnerships.
7. Measuring the impact: This is about what the institution has in place for measuring the results of its entrepreneurial strategy and activities.

From: HEInnovate.eu

It is understandable that a university cannot become entrepreneurial in one day. Clark (1998, 2004) stressed that it is an organizational change process of ten to 15 years. In a follow-up study at 20 universities, Gjerding *et al* (2006) concluded that for such a process to be successful requires a top-down leadership drive that welcomes bottom-up initiatives, "stimulating a culture of intrapreneurship" [35]. Nelles and Vorley (2009) referred to an entrepreneurial transformation process with five elements. They state that building an entrepreneurial architecture needs the development of organizational structures, communication and coordination systems that help in effectively relate the different initiatives, leadership – including vision - , strategies, and attention for the organizational culture which is the most difficult to change [36].

### *B. University comparison*

There are many cases described in literature of less or more entrepreneurial universities, but comparing different universities on their entrepreneurial status is difficult, in particular across countries. There are two main reasons for this. First, the way a university is embedded in and interacts with its context is fundamental for the entrepreneurial university concept. In other words, the extent to which a

university is entrepreneurial is to be understood within a specific context [37]. A recent study of ten universities in the USA and Europe came to the conclusion that clustering of universities around size and age is not useful for describing entrepreneurial differences [38]. What matters however is the regional and national context [39]. The literature reveals only one case in Indonesia other than IPB. In 2009, Damajanti and Zuhairi described the gradual entrepreneurial transformation process of Universitas Terbuka, Indonesian's Open University [40]. They mention several foci, among which the importance of networking and partnerships, creation of revenue generating programs, and systematic planning and open management. The most important trigger for change was the limited government funding which asked for a more entrepreneurial approach.

Second is of a methodological nature. Characteristic for the available frameworks is that they use perception-based instruments for exploring the entrepreneurial status of universities. HEInnovate and NCEE use Likert scales, ACEEU is listing issues to be addressed. This is not conducive for comparison among universities, because perceptions are context specific and subjective. Even more, an internationally agreed set of indicators measuring entrepreneurial universities does not exist, although attempts have been made. In 2003, a literature review of seven surveys on academic entrepreneurship in combination with a Delphi survey resulted in a long-list of input and output indicators on business creation inside higher education institutions, including weighted indicators (by academic staff and research expenditures) in order to allow benchmarking [41]. The input indicators were categorized in i) policies and strategies; ii) stock of technology; iii) resources and initiatives and iv) human capital. The output categories were i) start-up activity; ii) internal and external impacts, and iii) wealth creation. This set of indicators does not cover the broadness of entrepreneurial university as used in this study and in recent literature, and the large number of indicators may cause operational issues of data availability and costs.

In search of a measurement model for identifying a university's entrepreneurial orientation, Tijssen (2006) tested two indicators for university-industry linkages (one of the seven categories of the European Commission/OECD framework), i.e. public–private co-authored research articles, and citations within corporate research articles to university research articles. The findings indicated that other, context specific factors are more relevant for understanding the university-industry relations, in particular the country of location and the 'magnitude of research activities in industrially relevant fields of science' [42].

In 2008, the NIRAS survey on Entrepreneurship in Higher Education in Europe [43] used a broader framework focusing on student entrepreneurship as well as commercialization of research. Besides qualitative information, it developed a small set of quantitative indicators: Share of students enrolled for entrepreneurship courses as percentage of total amount of students; Number of executive education attendants; Number of students participating in extra-curricular activities; Number of patents; and percentage external funding. Although only partially covering the entrepreneurial university concept, virtue of this model is in its simplicity.

As a response to the lack of a uniform measurement system, an international working group launched in 2015 the Global Entrepreneurial University Metrics (GEUM) initiative to design appropriate metrics 'across all three missions of education, research and innovation/entrepreneurship' [44]. It is the intention that their findings will ultimately be used for modifying university ranking systems.

### *C. Entrepreneurship education in Indonesia*

It should be noted that besides the limited research on entrepreneurial universities in Indonesia, literature is available around the narrower concept of 'entrepreneurship education'. This is just one of the many aspects of the broader concept of entrepreneurial university. Entrepreneurship development gets a lot of attention in Indonesia. In 2015, entrepreneurs accounted for 1.56% of the total population [45]. This is low in comparison to the minimum of 2% as desired by the Indonesian government and to neighboring countries: in Singapore it is 7%, Malaysia 5%, Thailand 4.5%, and Vietnam 3.3% [46]. In order to increase this low percentage, universities in Indonesia including IPB are offering entrepreneurship education programs to students and are encouraging them to become job creators instead of job seekers. The purpose of the provision of the entrepreneurship education includes introducing students to entrepreneurship and motivating students and graduates to be self-employed and thus creating job opportunities. [47]

Several examples are described in literature, from Telkom University in Bandung – offering mandatory and elective courses, and from Ciputra University in Surabaya with its interdisciplinary, team-based business – and social enterprising projects. [48,49] Abduh et al (2012) is focusing on how Bengkulu

University is fostering entrepreneurial intentions of students [50]. A critical evaluation of the impact of entrepreneurship education is made by ITB in Bandung, expressing a growing concern that entrepreneurship education does not make students become entrepreneurs. Their findings have been compared with data from students and graduates of the Maranatha Christian University in Bandung: those who became entrepreneur are Chinese Indonesians from business families. These graduates indicated that they have learned to be entrepreneurial mainly from their relatives instead of from the university. [51] Last, a recent study on entrepreneurship education at 18 Indonesian vocational high schools assessed the entrepreneurial characteristics of students as being low and subsequently recommends to capacitate teachers, improve networking, and strengthen the entrepreneurial orientation of school management [52].

Concluding, literature on entrepreneurial universities in Indonesia is almost absent, and the available literature is focusing on entrepreneurship education. Globally, the majority of the literature on entrepreneurial universities is focusing on research-based knowledge transfer and commercialization with less insight on how entrepreneurial universities are when using the broader, non-economic perspective advocated by Burton Clark and measured with the European Commission/OECD framework. Last, no universal, objective system exists for comparing entrepreneurial universities. Thus, is it possible to identify university comparable indicators for an entrepreneurial university? What lessons can be drawn from Bogor Agricultural University, one of the prominent academic universities in Indonesia?

## III. METHODOLOGY

The analytical framework of the study is based on the European Commission/OECD self-assessment tool with its seven categories. The framework has been operationalized by identifying per category a set of variables and per variable indicators, resulting in 37 variables and 125 indicators. Data were collected between December 2015 and May 2016 from four categories of respondents - university leadership, faculty, students, and external stakeholders - using mixed methods: a content analysis of university policy and educational documents, a structured questionnaire, and in-depths interviews and focus group discussions. The sampling plan was made in order to get multi-perspective data about IPB: from those that are leading in the development of the institute, from employees, from the main client group (students) as well as from external relations.

The questionnaire for teaching staff was distributed to all 35 departments of the nine university faculties. From each department, the target was to get responses from the head of the department and three faculty members with different work experiences at IPB: up to 10 years, between 11-20 years and more than 20 years. The research among the students used probability, stratified random sampling to allow for statistically significant conclusions on population level. A sampling frame has been used with the name of all the seventh semester students and per student the Major indicated. The number of students in the sample per Major was a direct proportion of number of students of each Major with the selection of students made by using the 'random calculator'. The reason why only seventh semester regular Bachelor students were included was twofold. First, it was important to focus on students that already have several years of experience with IPB, thus able to give evidence-based responses. Secondly, it was argued that the student population should be as homogeneous as possible with respect to number of years at IPB and educational background.

The sampling for the interviews and focus group discussions was based on purposeful sampling, comprising all hierarchical management layers of IPB, staff with specific business and innovation oriented mandates, entrepreneurship education lecturers, young staff and female staff, the broadness of the university faculty structure, business representatives, students with no specific entrepreneurship interest, and students active in IPB's student-led Center of Entrepreneurship Development for Youth. See table 1 for the population and sample size and composition.

TABLE 1. POPULATION AND SAMPLE SIZE AND COMPOSITION

| | **Leadership** | **Teaching staff** | **Students** | **Externals** |
|---|---|---|---|---|
| **Research population size** | 25 | 1,092 | 3,640 | Not known |
| **Number of surveys distributed** | 20 | 145 | 708 | 1,289 |
| **Survey results** | 1 (5%) | 51 (35%) | 258 (36%) | 17 (1%) |
| **Interviews** | 9 | 12 | 0 | 8 |
| **FDG (number of participants)** | 0 | 3 (28) | 2 (20) | 0 |

The questionnaires for students and staff have been tested for validity and reliability using factor analysis. Since the questionnaires have been based on the seven categories of the European Commission/OECD framework, each category has its own validity score. All scores - Crombach's Alpha – are 0.5 or far above,

indicating that the questionnaire is valid and reliable. The questionnaire for the external stakeholders has not been tested because at least 30 responses were needed for testing.

In order to measure entrepreneurial transformation, a timeline analysis is used. This is a qualitative, participatory method in which respondents are asked to indicate when important changes occurred.

As a next step, quantitative indicators were chosen for comparison with other universities. A first source has been the NIRAS survey [53], allowing to compare IPB with universities in Europe. Next, three output indicators were chosen:

- The total number of student start-ups over the last three years scaled to the total number of students: a higher number is expected to occur in more entrepreneurial universities;
- The percentage of funding generated by the university through spin-offs, business development services, and joint ventures (of the total university budget): a higher percentage is expected to occur in more entrepreneurial universities;
- The percentage of externally sponsored research (of the total research budget), which is also one of the NIRAS indicators: a higher percentage is expected to occur in more entrepreneurial universities.

These indicators have been purposefully chosen for several reasons. First, the number has been restrictive in order to have the highest probability that data would be easily available at any university. Secondly, all three in togetherness cover a large component of the European Commission/OECD framework, thus may be a good indicator of the overall entrepreneurial status of a university: the number of student start-ups is related to 'entrepreneurial teaching and learning' as well as 'supporting entrepreneurs' and is in particular relevant in a context – like in Indonesia – that prioritizes entrepreneurship development among students and graduates. The period of counting the number of start-ups is set to the last three years in order to avoid biased yearly fluctuations. Funding generated by a university through spin-offs, business development services, and joint ventures implies that these business development activities are taken place, hence relates to the framework categories 'university strategy', 'organizational capacity', 'supporting entrepreneurs' and 'knowledge collaboration'. Last, externally sponsored research implies that stakeholders are interested in knowledge generated by the university, hence 'knowledge exchange and collaboration' exists, which is a fundamental aspect of being an entrepreneurial university.

Data comparison took place as follows: first, the NIRAS-derived indicators of IPB were compared with the result of the 2008 European survey. Second, all 77 Indonesian public higher education institutions, among which IPB, that participated in the student start-up scheme of the Ministry of Education were compared by using the student start-up indicator. Excluded is one university that in 2015 changed its status from private to public [54]. Student start-ups is defined by the assumption of winning and subsequently funded business ideas. Thirdly, comparison on all three indicators was possible among a more heterogeneous group of 16 universities in Asia, including IPB. These data were collected in the framework of a training on 'Entrepreneurial University Transformation in South-East Asia' [55].

## IV. MAIN FINDINGS

Students, teaching staff and external stakeholders had in general a positive perception of the entrepreneurial status of IPB. Table 2 shows that all values (but one) are beyond the average of 3.5 indicating that the respondents score more positive than negative on statements about entrepreneurial characteristics of the university. No significant differences have been found by sex or number of years working at IPB with *t*-tests analyses. A paired comparison shows that students, teaching staff and external stakeholders had significantly different views of IPB entrepreneurial status. The students scored the highest compared to the other two groups. Teaching staff were less positive than the external stakeholders and the students.

TABLE 2. PERCEPTION OF STUDENTS, STAFF AND EXTERNAL STAKEHOLDERS ON IPBs ENTREPRENEURIAL STATUS, TOTAL MEAN PER CATEGORY OF THE ENTREPRENEURIAL UNIVERSITY FRAMEWORK (6-POINTS LIKERT SCALE)

| | **Students (n=258)** | **Teaching staff (n=51)** | **Externals (n=17)** |
|---|---|---|---|
| **1. Leadership & Governance** | 4.27 | 4.04 | 4.30 |
| **2. Organizational Capacity** | 4.09 | 3.84 | 3.89 |
| **3. Entrepreneurial Teaching and Learning** | 4.22 | 3.93 | 4.10 |
| **4. Preparing & Supporting Entrepreneurs** | 4.15 | 3.49 | 3.95 |
| **5. Knowledge Exchange & Collaboration** | 4.18 | 3.95 | 4.17 |
| **6. Internationalization** | 3.99 | 3.97 | 4 |
| **7. Impact measurement** | 4.16 | 3.43 | 3.97 |

### A. University leadership

The content analysis of university documents as well as the information obtained in interviews and focus-group discussions indicated that for more than a decade, the IPB leadership has been following a consistent strategy of creating a more entrepreneurial university. This is reflected in the vision of the university that explicates the entrepreneurial research-based focus of IPB. In the period 2008 - 2012 IPB envisioned to become a world class research university with core competences in tropical agriculture and biosciences with entrepreneurial characteristics. IPB's 2013 – 2018 vision emphasizes more on down-streaming of innovation. Weaker aspects were that organization-wide understanding of the implications of this leadership vision seemed limited. Information was missing – or not understood – explaining the expectations to each employee and the desired results. This resulted in three ideas that existed among the IPB community on what entrepreneurship implies for IPB: i) One dominant stream was focusing on commercialization of faculty-based technology-oriented research through patents; ii) Other people referred to the development of entrepreneurial characteristics of students, to be reflected in all educational programs; and iii) Also existent widely among staff and students was a more narrow definition of entrepreneurship development: entrepreneurship was considered to be important, but to be addressed in extra-curricular activities or specific entrepreneurship courses.

### B. Research-based commercialization

In line with the national strategy of the Ministry of Research, Technology and Higher Education to provide widely applicable innovation [56], the IPB leadership has been focusing successfully on commercializing faculty-based technological research (see table 3). This resulted in the mentioned national awards and improved QS ranking as rewarding milestones. Food, renewable energy and medicine are three of the seven long term (2005-2025) research foci of the Ministry, where IPB also focused its research on [57]. Leadership underscored also the responsibility of IPB as public university to contribute to the development of the country as well as the ASEAN region, which is reflected in 33 innovations used for community development in 2016 [58]. An organizational structure and procedures have been set-up to streamline IP-issues, prioritize most relevant research, and to maximize patent outputs. In addition, the IPB holding company (Bogor Life Science and Technology, BLST) has been strengthened as the vehicle for commercialization of patents, acting as the linking pin between the university research and business. A start has been made with developing the IPB science park, with incubation facilities, offices, and businesses. This coincides with the findings of Payumo *et al* (2013) about how IPB was managing intellectual property as a manifestation of research-driven entrepreneurial developments at the university. They showed that sales of IPB's trademark registered natural-based, herbal and fast food products have been increasing. IPB facilitated patent registration, incentivized researchers with 40% of royalties, and used the number of patents as one of its key performance indicators.

TABLE 3. COMMERCIAL AND PUBLIC USE OF IPB RESEARCH

| | **Baseline (2015)** | **Target 2016** | **Realization 2016** |
|---|---|---|---|
| **Commercialized innovations** | 3 | 10 | 9 |
| **Innovations used by community** | 26 | 25 | 33 |

Source: IPB Annual Report 2016

The interviews indicated that the Achilles heel in the IPB commercialization approach seemed to be university-business relations. Partnerships with businesses were limited, and businesses were hardly involved in the knowledge generation process. The dominant mind-set of the IPB officials responsible was on 'knowledge transfer' not on 'knowledge generation' or 'co-creation'. The applicability of IPB's inventions and the market orientation of researchers was limited. The focus has been more on quantity than on quality and usability, as also indicated by Payumo *et al* (2013): they warn for a 'patent number trap' because "The increase in patent numbers does not necessarily indicate that IPB's innovation outputs are contributing to economic growth".

### C. Learning and teaching processes

Many IPB students had a micro-business out of financial necessity, and many faculty members had their individual consultancies. This implies that an entrepreneurial spirit and experience was present within the IPB community. However, the number of students that continued their money-earning micro-business after study was limited and students' interest in entrepreneurship was declining during study. Consultancy work of faculty was mainly outside the university as an individual revenue-generating activity. At IPB level, there was no strong push, HRM policy, or coordination mechanism to alter this situation. This resulted, in combination with the fact that the majority of IPB faculty was spending most of their time on teaching, in the situation that faculty did not see a connection between their daily work and IPB's entrepreneurial strategy which prioritizes

commercialization. In addition, market oriented transdisciplinary or multidisciplinary academic programs were scarce at IPB, with staff and faculty feeling primarily loyal to their department.

Leadership indicated that it was supporting entrepreneurial behavior from staff and students, however faculty did not feel incentivized – and sometimes even stated to be hampered by internal regulations - for spending time on coaching and training students beyond lecturing, or on developing new, more entrepreneurial courses. Development of students' entrepreneurial skills and attitude was considered to be important, but operationalization was scattered. Limited attention was given to making the teaching and learning processes more entrepreneurial and almost all entrepreneurship development activities were extra-curricular. However, neither students nor faculty had time for these extra-curricular activities.

### *D. Timeline analysis*

The findings described above are indicating the situation at IPB in 2015, early 2016. Transforming a university to become more entrepreneurial is however a process of many years, and often starts because of a sense of urgency [59,60]. Respondents have been asked to indicate important milestones over a period of ten to 20 years (see table 4).

The table reflects the findings above, demonstrating an important role of the university leadership, a consistent focus on commercialization (started in 1999 with the establishment of the IP office), and less attention for the teaching and learning processes. A few early initiatives have taken place, like the 1994 establishment of the Incubator Center, but these remained sporadic activities without institutional impact. The entrepreneurial transformation process ignited in 2000 with the implementation of the autonomous status of the university (BHMN) granted by the government of Indonesia. This autonomy paved the way for many internal changes, including the creation of a Board of Trustees and an academic senate, and streamlining of the university's organization. Most importantly was that it allowed IPB to manage its own resources [61]. As a direct result, the IPB leadership established in 2003 the university holding company BLST.

TABLE 4. TIMELINE OF THE IPB ENTREPRENEURIAL TRANSFORMATION PROCESS BY CATEGORIES OF THE EUROPEN COMMISSION/OECD FRAMEWORK

| | **Before 2000** | **2000 – 2004** | **2005 - 2009** | **2010- 2014** | **2015 - 2016** |
|---|---|---|---|---|---|
| **Leadership & Governance** | | | 2008: Entrepreneurship in the mission; New position created of Vice Rector for Business | 2010: Start student selection a/o using entrepreneurship criteria; 2013: Research-based university | 2015: CEOs in Advisory Board |
| **Organizational Capacity** | | **2000: Government Regulation No 154/2000 on autonomy status of IPB (BHMN)** | | | |
| **Entrepreneurial Teaching and Learning** | Early 1980s: entrepreneurship teaching at Department of Postharvest Technology; 1998: 'Entrepreneurship and Small Business Management' as core subject for Agribusiness Major | | 2005: Introducing mandatory BSc course Entrepreneurship Introduction | | |
| **Preparing & Supporting Entrepreneurs** | 1994: Establishment Incubator Center | 1999: Establishment of the IP Office; 2003: Establishment of Bogor Life Science and Technology (BLST), IPB's holding company | 2008: Start Business Innovation Center / IP innovation process; 2009: Start Business Plan Competition students | 2014: Foundation IPB Science Park | 2015: IPB Incubator founded; Investment Summit |
| **Knowledge Exchange & Collaboration** | | | 2007: Implementation of Agribusiness Development Center (In | Series of exhibitions and ABGC meetings (Academician- | 2015: Investment Summit; 2016: Launch of the Open Innovation Platform |

| | | | | | |
|---|---|---|---|---|---|
| | | | cooperation with ICDF-Taiwan) | Business-Government-Community) | |
| **Internationalization** | | | 2007 onward: cooperation with international partners in commercialization of IPB's innovations | | |
| **Impact measurement** | | | | 2011: Implementation of BSC | 2015: Implementation of TRL (Technology Readiness Level) on products of innovation |

Source: interviews and content analyses of IPB documents

### *E. Quantitative indicators: NIRAS*

Part of the above is illustrated by the quantitative indicators derived from NIRAS (2008), see table 5. Only a limited percentage of students followed a degree based entrepreneurship course (excluding participation in the compulsory introductory course in year one of the Bachelor study). The participation of students in extra-curricular programs was high because of group-based participation in business competitions where students could win a grant.

The number of granted patents is an indication of the focus of IPB on research, a number that increased over time [62]. Funding by non-government sources was limited: financial need had not been driving the commercialization agenda of IPB, being almost fully central-government funded. However, recently the Indonesian government has started to reduce the budgets for universities which will give more importance to generating additional revenues.

TABLE 5. IPB INDICATORS, COMPARED TO THE RESULTS OF THE 2008 NIRAS SURVEY AMONG EUROPEAN UNIVERSITIES

| **Entrepreneurial students through education** | **IPB 2015** | **NIRAS 2008** |
|---|---|---|
| **Share of students enrolled for entrepreneurship courses as percentage of total amount of students** | 4% | - |
| **Number of students** | 590 | 1104 |
| **Knowledge transfer to society** | | |
| **Number of patents: 2010 – 2015** | 63 | - |
| **% external funding** | 4.8% | - |
| **Entrepreneurial students through practice** | | |
| **Number of students participating in extra-curricular entrepreneurship activities** | 2500 | 357 |

### *F. Quantitative output indicators: comparing IPB with other Indonesian and Asian universities*

The high number of IPB students that participated in business competitions is reflected in the only indicator on which data could be found from all public universities and public vocational institutions in Indonesia, i.e. the total number of student start-ups over the last three years scaled to the total number of students. The data of 77 institutions are presented in figure 1. IPB scores 0.778, which is part of the 10% highest scoring public higher education institutions. The overarching majority of these public institutions score low on this indicator: 83% less than 0.5. This implies that the overarching majority of Indonesian public higher education institutions had only very few students who managed to get a government grant for a business start-up proposal. In absolute numbers: 37 of the 77 public higher education institutions had less than 10 students winning a grant over the last three years. IPB is part of the group of top ten institutions (all public universities) that had more than 100 students winning a grant (with Universitas Gadjah Mada and Universitas Brawijaya best performing with both more than 200 students winning a grant over the last three years).

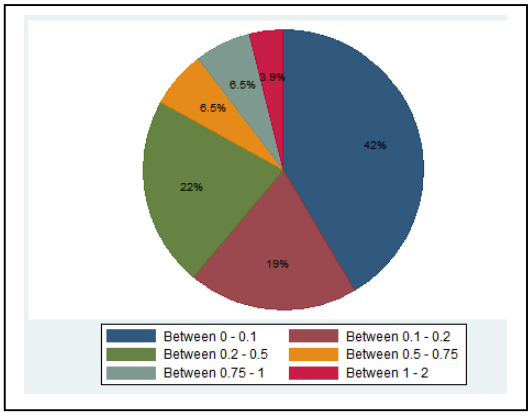


Figure 1. Number of start-ups scaled to number of students, period: last 3 years x100, N = 77 public higher education institutions

As an additional analysis, the scores have been grouped by the 58 public universities and by the 19 vocational institutions ('Sekolah Tinggi' and 'Politeknik'), subdivided by year of foundation (see table 6). The threshold between older and younger institutions is set at founded before or after 1990 which is roughly 25 years ago. In the Asian context with relatively young nations, this is considered to be a more appropriate threshold than the threshold of 50 years as used by the QS ranking of top young universities. A difference in findings was expected because the vocational institutions are far smaller than most of the universities (in terms of student populations), and because of their different, skills oriented study programs. Also it was assumed that younger institutions might be more geared towards stimulating entrepreneurship.

The contrary is however the case if based on the student start-up indicator. The two higher scores are fully absent among the group of younger public universities (threshold: founded in 1990 or more recently). IPB, founded in 1963, is part of the 17% highest scoring, older public universities. In absolute numbers: IPB is part of the top five older, public universities from the total of 43 older, public universities. The same pattern is visible among the vocational institutions (NB: only two vocational institutions are founded more recently than 1990). In addition, the findings do not underpin the hypothesis that vocational institutions would score different than the universities.

TABLE 6. NUMBER OF START-UPS SCALED TO NUMBER OF STUDENTS, PERIODE: LAST 3 YEARS x 100, N = 77; BY TYPE OF UNIVERSITY AND BY YEAR OF FOUNDATION

| | Public universities (N=58) | | Public vocational institutions (N=19) | |
|---|---|---|---|---|
| | **Founded before 1990 (n=43)** | **Founded in 1990 or more recent (n=15)** | **Founded before 1990 (n=17)** | **Founded in 1990 or more recent (n=2)** |
| **Between 0 - 0.1** | 28.0% | 73.0% | 59.0% | 50.0% |
| **Between 0.1 - 0.2** | 26.0% | 9.1% | 5.9% | 50.0% |
| **Between 0.2 - 0.5** | 30.0% | 9.1% | 12.0% | 0.0% |
| **Between 0.5 - 0.75** | 6.4% | 9.1% | 5.9% | 0.0% |
| **Between 0.75 - 1** | 6.4% | 0.0% | 12.0% | 0.0% |
| **Between 1 - 2** | 4.3% | 0.0% | 5.9% | 0.0% |
| **More than 2** | 0.0% | 0.0% | 0.0% | 0.0% |

Comparable data of Indonesian private universities are not shared in the public domain and only available on request. Limited additional data obtained in this study hint at private universities performing better on this indicator than public universities: two universities score between one and two, and one university scores far above two, a high score that is absent among the public universities. The university that only recently changed from private to public status, scores between one and two. Last, the University of Twente, considered to be an international benchmark for entrepreneurial universities, scores between one and two which is in the same category as the two best Indonesian public universities [63].

Also internationally, IPB is part of the better performing universities on this indicator. Comparison of IPB with 15 Asian public and private universities (located in Bhutan, India, Indonesia, Nepal, the Philippines, Sri Lanka, and Vietnam[1]) showed that IPB is part of the 31% highest scoring universities (5 out of 16), see figure 2. The two highest scoring universities are private universities.

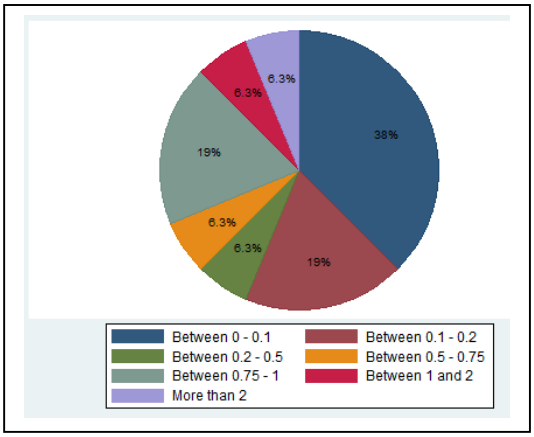


Figure 2. Number of start-ups scaled to number of students, period: last 3 years x100, N = 16 universities in Asia, among which IPB

[1] Bhutan: Royal University - Bhutan Business College, Royal University, Royal Thimpu College; India: University Institute of Information Technology, Himachal Pradesh University; Indonesia: National Institute of Technology, Undiknas University; Nepal: Sagarmatha Engineering College, Academy of Policy and Development, Pokhara University; Philippines: ASU, Ateneo de Zamboanga University, Caraga State University, CBSUA, Eastern Visayas State University; Sri Lanka: University of Sri Jayewardenepu

In addition to the data on student start-ups, data on the two financial indicators could be obtained from the same Asian universities, see table 7. IPB is scoring relatively low on both indicators within this group of universities, which reflects IPB's reliance on central-government funding. Analysis of the data results in no clear patterns. Neither if sorted by public or private university, nor if sorted by year of foundation (with as threshold the year of 1990). Even more, there seems no relation between the two financial indicators, neither directly proportional nor inversely proportional.

TABLE 7. PERCENTAGE FUNDING BY UNIVERSITY SPIN-OFFS ETC. OF TOTAL ANNUAL BUDGET (2015/206) AND PERCENTAGE OF EXTERNALLY FUNDED RESEARCH (OF TOTAL RESEARCH BUDGET 2015/2016), N = 16 ASIAN UNIVERSITIES

| Public or private university | % funding generated by the university through spin-offs, business development services, joint ventures (year-1) | % of externally funded contract research as proportion of total research budget (year-1) |
|---|---|---|
| Private | 0% | 0% |
| Public | 0% | 0% |
| Public | 0% | 70% |
| Public | 0% | 60% |
| Public | 0.60% | 82.41% |
| Private | 2% | 70% |
| Public | 2.63% | 57.18% |
| IPB (public) | 5% | 19.47% |
| Public | 9% | 70% |
| Private | 10% | 100% |
| Public | 10% | 35% |
| Public | 11% | 14.50% |
| Private | 18% | 86% |
| Public | 25% | 1.50% |
| Public | 26% | 93% |
| Public | 40% | 35% |
| **Mean** | **10%** | **50%** |

When the results on all three indicators are plotted together in one graph (see figure 3), it becomes clear that there is no similar pattern among values of the three indicators. In the case of IPB (number 6 in the graph) the indicator for student start-ups is among the highest in this group, whilst it scores relatively low on the financial indicators. The findings indicate that if these indicators are to be used to measure the entrepreneurial status of a university, different, possibly opposing conclusions can be drawn for the same university.

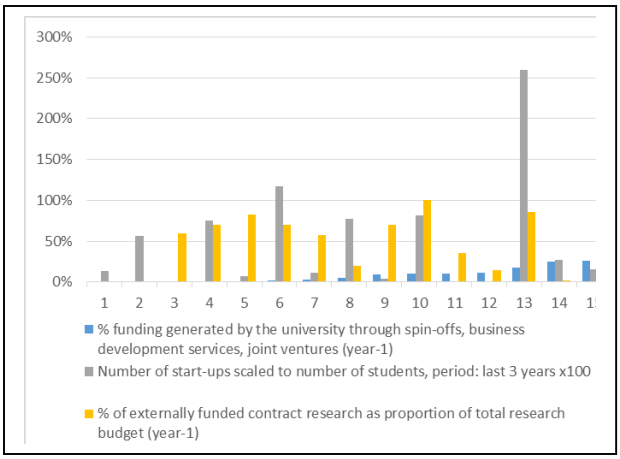


Figure 3. Results on 3 output-indicators, N = 16 public and private universities in Asia, among which IPB (number 6)

## V. DISCUSSION

The findings of the IPB assessment, as presented above, lead to the main conclusions that the leadership at IPB is – and has been - stimulating a change into a more entrepreneurial university with a focus on commercialization of faculty-based research. IPB is indeed entrepreneurial in this sense and can demonstrate tangible results. In addition, qualitative information indicates that the entrepreneurial development of the learning and teaching processes is lagging behind, however when quantitatively assessed, the student entrepreneurship output is high in relation to many other universities.

IPB is a good illustration of research-based technology transfer and innovation as advocated by Etzkowitz [64,65], but the picture is more mixed from the perspective of Clark's broader institutional perspective [66,67] as assessed with the European Commission/OECD framework. Relating the findings to the definition of entrepreneurial university [68], it can be concluded that 'empowering its staff and students to demonstrate enterprise, innovation and creativity' is positive considering the commercialization of faculty-based research and number of grants for student start-ups, but still needs more attention. In addition, IPB is weak in the 'use of knowledge across boundaries' with its academic processes predominantly mono-disciplinary organized. Concerning 'creating public value via a process of open engagement, mutual learning, discovery and exchange with all stakeholders in society' IPB is strong in support to community development, but knowledge creation through partnerships is limited.

IPB is an example of the top-down and university-led model as identified by Graham (2014) in a study

among world's most highly-regarded entrepreneurial universities [69]. This model is 'typically triggered by the desire to realize income from university research' with a focus on technology transfer. Graham stresses that this may lead 'to a culture where "only university-protected IP is seen as worthwhile" on the expenses of among others student-based entrepreneurship, which concurs with the IPB findings. Interesting is that this possible downside of a commercialization focus is neutralized in the case of the National University of Singapore through internal coordination, directly linking education, student focused entrepreneurship with the high-tech commercialization agenda of the university [70]. These 'communication and coordination systems' [71] are yet to be improved at IPB.

The case of IPB also illustrates that entrepreneurial transformation needs momentum where an external trigger coincides with visionary campus leadership. At IPB the spark was the autonomy status and the related option of reducing government funding. IPB's leadership pro-actively responded and turned this threat into business opportunities. Similar imperatives for change are behind the success story of the University of Twente (UT) and the National University of Singapore, as well as mentioned in the case of the University of Terbuka [72,73,74]. The UT underwent a change process out of pure necessity: dislocated in the East of the Netherlands, the number of students was too limited at a time that government was starting to diminish funding. The entrepreneurial development ignited with new central leadership that had a vision and the perseverance and power to make it happen.

In the search for finding indicators for the entrepreneurial status of a university that also would allow university-university comparison, the assessment shows that IPB uses the number of (commercialized) patents as indicator for entrepreneurial commercialization (as part of the Balance Score Card and one of the NIRAS indicators). The legitimate question is what and how to measure results and impact of the entrepreneurial strategy beyond this indicator. If university-based entrepreneurial growth is a priority, university performance metrics need to be revised to reflect this. This study contributed in this debate by testing three quantitative indicators derived from the European Commission/OECD framework. A choice has been made to come up with output indicators that measure direct results of entrepreneurial actions by the university. It is assumed that such data can be collected by universities relatively easy. Throughput, the internal entrepreneurial process, is measured by two of the NIRAS indicators, i.e. Share of students enrolled for entrepreneurship courses, and Number of students participating in extra-curricular entrepreneurship activities. In the understanding that entrepreneurial universities are meant to contribute to the (socio-) economic development of the region in which they operate [75], measuring impact would be appropriate as well, but methodologically more complex.

The findings indicate that although seemingly objective, interpretation of results can still be highly context specific. This is in line with studies from Tijsen [76], Foss and Gibson [77], and reflected in the predominant methodological approach of using case study research with perception-based framework for understanding entrepreneurial universities. This is true for the two financial indicators, but less for the start-ups indicator.

If strengthening student entrepreneurial behavior is of importance, which is the case in Indonesia and many other countries [78], then the start-ups indicator seems a doable, straightforward indicator: it gives an idea of the conducive environment that allows students grasping a (financial) opportunity. This indicator is related to two categories of the European Commission/OECD framework: 'entrepreneurial teaching and learning' and 'supporting entrepreneurs'. It cannot be causally related to 'university strategy and governance', because the number as such gives no information to what extent the student' activity is because of a deliberate university policy. Also, it gives no indication on how good, hence viable, these start-ups are. A related output indicator – not used in this study – is the (weighted) number of start-ups actually started, or still alive after a certain period of time. Currently, only a limited number of universities collects and discloses such information.

Seemingly, when measuring the results of entrepreneurial knowledge generation (the 'Knowledge Exchange and Collaboration' category of the European Commission/OECD framework), the percentage of external research funding is a logical output indicator. However, the results of this study indicate that this indicator may be affected by external factors like for instance governmental regulations and funding opportunities. The same can be said for the other financial indicator: the percentage of income out of spin-offs, business development services, and joint ventures. At IPB, spin-off companies are (co-)owned by the university, generating income for the mother institution. But for instance at the University of Twente, considered to be one of the most entrepreneurial universities globally, spin-off companies are not owned by the university. As a

result, income out of spin-offs is negligible: the university supports and promotes spin-offs, but all revenues stay within these commercial entities and are for individual university staff that is involved [79]. Hence, it is incorrect to base a conclusion on the entrepreneurial status of a university solely on this indicator. A single indicator may only have value to measure the status of a specific aspect of the entrepreneurial university framework.

Given the importance of multi-stakeholder knowledge exchange and partnerships for entrepreneurial universities in the European Commission/OECD framework and the work of Etzkowitz [80] which coincides with recent literature positioning the university as one of the actors in an entrepreneurial ecosystem [81], other possible output-indicators, to be validated, are the estimated number of active partnerships with private sector and government, the number of industry scholarships for students and teaching staff in the university, the number of joint university-industry centers, labs, educational programs and institutes, or the number of joint research publications with an industry partner.

## VI. CONCLUSIONS

In the present study, the authors used the European Commission/OECD framework to assess the entrepreneurial status of IPB. This framework is useful because of its holistic perspective and standardized approach which allows for comparison and learning within and among universities. The magnitude of the framework however complicates an assessment and necessitates a costly, multi-methods approach to interpret the perception scores. This study indicated that it is difficult to come up with a simpler, quantitative framework that results in context-independent comparative data. And that it is difficult to attribute entrepreneurial outputs to intended university strategies and activities. More testing of several quantitative indicators on their relevance and interpretation in different contexts is needed. Methodologically even more complex is to measure the impact of entrepreneurial universities on socio-economic development, an area of research that needs much more attention.

In addition, capturing of an organizational transformation process requires a longitudinal approach, collecting same data over time. Whilst these data are often not available, a timeline analysis as used in this study is a way to explore the causes of entrepreneurial changes. The authors recommend to integrate this methodology in researching transformation processes.

The results of this study have relevance for the higher education community in terms of understanding the complexity of transforming institutions into more entrepreneurial organizations in Asia. To the best of the authors' knowledge, there is not any previous study that examines entrepreneurial characteristics of universities in Indonesia in this comprehensive manner.

The study has also relevance when put in the context of the global trend from faculty-based technology transfer towards student-based entrepreneurship, stimulation of creativity, and the development of entrepreneurial ecosystems (Wright and Kelly at the UIIN conference 2016, non-published). Stimulating creativity among students in a conducive environment is supposed to have a far reaching impact on social and economic development, because this creativity is the foundation for innovation. With its high number of grants for student start-ups, IPB seems on the right way.

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